

Emerging technologies for nutrient recovery from digestate

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In a transition from a fossil reserve-based to a bio-based economy, resources are to be managed more effectively. Nutrient cycles in agriculture should be closed to a maximal extent. Anaerobic digestion of sewage sludge, organic biological waste and animal manure has emerged as an energy-efficient, environmentally friendly technology for processing the waste. It results in the production of bio-energy and a concentrate of solid remnants, the digestate, in which the nutrients are concentrated. Especially in high-nutrient regions, digestates can often not or only sparingly be returned to land in their crude unprocessed form. Processing digestate aims to recover products with well-defined properties and nutrient composition that have the potential to replace conventional fertilizers in agriculture. A range of technologies to process digestate has been explored at various scales. Struvite precipitation/crystallization, ammonia stripping and (sub-sequent) absorption using an acidic air scrubber currently appear as the best available technologies to be applied at full-scale for nutrient recovery as marketable fertilizer commodities. Recovered bio-based fertilizers include renewable N/P-, K/P-, or P-precipitates, P-extracts, N/S-solutions, N/K-concentrates, N-zeolites, and biomass. Future research should explore, verify, and improve the fertilizer characteristics and marketing value of these products towards industrial and agricultural end-users.

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